

Tritium ageing studies for « LMJ target » applications

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In order to achieve inertial confinement fusion (ICF), a capsule is filled by permeation with a deuterium-tritium (DT) gas mixture at room temperature, which is then solidified at 20K. The nominal scheme chosen by CEA is the Indirect Drive (ID). In this configuration, the microshell is located at the center of a hohlraum included in a Cryogenic Target Assembly (CTA) in order to be filled, and then manipulated by several cryogenic grippers at 20K from the filling site (CEA Valduc – Dijon) to the center of the LMJ chamber for the laser shot (CEA CESTA – Bordeaux).

The CTA for LMJ and its instrumentation are composed of various materials : metallic, ceramic and organic. One micron thick polyimide membranes close the hohlraum and need to be helium-tight at cryogenic temperature.

The evolution of the physical properties of these materials is not known when they come into contact with pressurized mixtures of DT. In order to study these effects, membranes undergo tritium ageing.

These samples are installed within a high pressure vessel thereafter filled with a 400 bar mixture of DT or pure tritium at room temperature during 6 hours. The glove box dedicated to study these tritiated target samples is equipped to compare before and after tritium exposure.

The permeability of tritiated and non tritiated polyimide membranes was studied from room temperature to cryogenic temperature with helium and hydrogen.